1886MNRAS..46..445G

show that the period found above cannot be very far from the truth. With the exception of *δ Equulei*, it seems to be the shortest period yet computed for a binary star.

The following is a comparison between the recorded observations and the positions computed from the above elements :—

| Epoch. | $\theta_o$ | $\theta_c$ | $\theta_o - \theta_c$ | $\rho_o$ | $\rho_c$ | $\rho_o - \rho_c$ |
|---|---|---|---|---|---|---|
| | ° | ° | ° | ″ | ″ | ″ |
| 1867·8 | 260·8 | 260·2 | +0·6 | 0·48 | 0·51 | −0·03 |
| 1878·70 | 84·2 | 85·0 | −0·8 | 0·42 | 0·53 | −0·11 |
| 1880·62 | 62·1 | 61·4 | +0·7 | 0·55 | 0·40 | +0·15 |
| 1881·61 | 36·1 | 38·2 | −2·1 | 0·31 | 0·29 | +0·02 |

Owing to the closeness of the components, and the great southern declination of the star, it cannot be well measured in this country. It is therefore to be hoped that observers in the Southern Hemisphere will pay some attention to this interesting binary during the autumn of 1886 and 1887. If the above elements are correct, the position-angle and distance must at present be nearly the same as when the star was measured in 1867, a complete revolution having been performed in the interval, and no more favourable opportunity of measuring it will occur till the year 1896.

The position of the star is for 1886·0

$$\text{R.A. } 18^{h}\ 55^{m}\ 21^{s}$$
$$\text{S. } 30^{\circ}\ 3'\ 20''$$

The formulæ for calculating an ephemeris are

$$u - 9{\cdot}728 \sin u = -19^{\circ}{\cdot}26\ (t - 1882{\cdot}86)$$
$$\tan \tfrac{1}{2}V = 1{\cdot}19 \tan \tfrac{1}{2} u$$
$$\tan(\theta_c - 83^{\circ}\ 22') = 0{\cdot}5180 \tan(V + 263^{\circ}\ 21')$$
$$\rho = 0''{\cdot}53\ (1 - 0{\cdot}1698 \cos u) \,.\, \frac{\cos(V + 263^{\circ}\ 21')}{\cos(\theta_c - 83^{\circ}\ 22')}$$

where $u$ is the eccentric anomaly, and V the true anomaly for the time $t$, $\theta_c$ the required position-angle, and $\rho$ the distance.

The magnitudes of the components are about 3·5 and 4·0.

1886, *May* 25.

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## *The Northern Hemisphere of Mars.* By N. E. Green.

It has been considered advisable to re-examine the details of the northern hemisphere, in order to correct or improve the map of *Mars* published in connection with the Madeira Series in 1877, that portion of the map being formed from drawings made in 1873, and considered provisional.

A careful study of the northern markings was made by Mr. Knobel in 1884, and during the recent opposition the writer has

1886MNRAS..46..445G

followed the planet with renewed attention. The result of these observations has been the confirmation of many of the old forms and the filling in of details over an extensive portion of the surface lying between longitude 90° × 180°, which part was nearly a blank in the map of 1877.

Some differences exist between that map and the one produced by Mr. Knobel from his observations in 1873 and 1884, to which special reference is made in this paper.

The instrument employed in the recent observations is an 18-inch Reflector; the speculum was figured by Mr. G. With of Hereford, and is of the highest quality. The powers employed varied between 280 and 560, the latter being used most frequently. The details of the northern hemisphere of *Mars* require steady air and great amplification in order to form a true estimate of their shapes, and it was found that the more delicate markings could not be drawn without the assistance of a power of 400. Many forms of eyepiece were tried, but that which gave the best results was a binocular of the usual microscopic shape, screwed to a tube connected with the adjusting rack. As this binocular eyepiece gives an erect view, it was considered better to complete a series of drawings in this new position, without comparing them with previous views till they were finished; and it was very interesting to observe afterwards how the forms which at the telescope appeared new and strange fell into their places, and in many instances agreed closely with the map of 1877. A copy of this map, together with a new one of the northern portion, produced from the drawings made this year, accompanies the paper.

On comparing these maps, it will be seen that from longitude 0 to 60° there is but little change, though Airy Sea is now a less definite form. From 90° to 180° an entirely new set of markings appear, some of them strongly resembling the light mark called Fontana Land at longitude 210°. These shapes were singularly definite, and of the truth of their forms and colour the observer has no doubt.

Huggins Inlet, passing from Maraldi Sea across the equator towards Fontana Land, has been observed on several occasions, but appeared as a broader and fuller mark than in the views by Mr. Knobel and others.

From longitude 210° to 300° there is no definite change. The termination of Nasmyth Inlet, called Lassell Sea, has been a most prominent mark during the opposition just past, but less extended towards the equator than as drawn in the older map. The light space called Leverrier Land has been seen as a clear separation between Lassell and Knobel Seas. It is at this portion of the map Mr. Knobel thinks that corrections should be made, but the most close and continued observation has failed to discover any decisive difference of shape between the forms observed in 1873 and during the past opposition.

It is but just to remark that in 1884 a drawing was made of

1886MNRAS..46..445G

the termination of Nasmyth Inlet which agrees exactly with the description of its shape at page 280 of Mr. Knobel's Memoir; and certainly during that opposition there was no approach to the definite rounded form seen this year.

I am indebted to Mr. Denning of Bristol and Mr. Smart of London for several views of *Mars*; and the drawings of both these observers confirm the existence of Lassell Sea as a roundish spot.

One of the most marked features of the opposition now past has been the frequent appearance of masses of light on the limb which never arrive at the meridian, and that the orange portions of the surface so frequently seen on the meridian do not retain this colour as they pass towards the limb, but become whitish. May not this suggest that cloud condensation prevails on the right side of the planet, and that these masses of cloud are dispersed as they pass the meridian towards the Sun?

The character of the markings on *Mars*, the difficulty of observing, and still more the difficulty of drawing them, will continue to make this planet, if not a satisfactory, at least a most interesting, object of study.

## *On the asserted Foreshortening of the Inner Side of the Penumbra of Spots when near the Sun's Limb.* By Rev. F. Howlett.

I am desirous of placing on record some definite statements and measurements in connection with the appearance of certain symmetrically shaped solar spots, both when near the centre and also when close to the limb of the Sun.

It will be found that these measurements entirely militate against the commonly received opinion that the spots are to any such extent sunk in the solar surface as to produce always those effects of perspective foreshortening of the inner side of the penumbra (when near the limb) which have been described in various works on Astronomy, and founded chiefly, I believe, on statements made as long ago as the year 1769 by Dr. Wilson of the University of Glasgow.

These statements and observations on the part of Dr. Wilson are so extremely circumstantial that I am far from desiring to call them in question, though I beg to be allowed to affirm that they at any rate do not always hold good.

Dr. Wilson's statements are thus alluded to in Mr. Proctor's very full and interesting popular work *The Sun*, ed. 1871, p. 169. "In November 1769 Dr. Wilson began the careful study of a large spot (visible to the naked eye). . . . When he first examined the spot (Nov. 22) it was situated not very far from the western or 'preceding' edge of the Sun's disk.

"On the next day he found that the spot had changed its appearance. The penumbra, which on the previous day was